

Critical Success Factor (CSF) Analysis for DoD Risk Management

CSF—More Than Making a List

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In the September-October 2001 issue of *Program Manager*, I provided a short description of the Critical Success Factor process model. On p. 49 of that article, I reference a statement from Navy Rear Adm. John A. Gauss, San Diego Space and Naval Warfare Systems Command Program Executive Officer (PEO). Speaking on the applicability of the CSF analysis, Gauss said, in part:

"...it [CSF analysis] is one of the first and most important steps to take in order to build a successful risk management program."

In this article, I will address this one aspect of CSF analysis—its use in risk management.

Every Risk is a Future Event

We are all familiar with typical risk management processes. The fundamental notion is that we identify risks, we assess their probability of occurrence, and we assess the consequence of occurrence. Then we put a risk management plan in place that is designed to eliminate, or alleviate the impact of, the serious risk events. Every risk is necessarily a future event, and only when the risk event actually happens is the risk transformed into a problem. The better we are at identifying risks and understanding the underlying basis of our risks, the better we can manage the risks. Our objective is to eliminate as many as possible of the serious risks.



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One of the struggles we always have in risk management is assessment of the probability of a risk event. Almost always, some level of guesswork is involved, and that implies we have a certain level of confidence in our assessment of probability. The better we become at eliminating the guess factor, the more confidence we can have in our assessment, and the more confidence we can have in the correctness of the investments we make in terms of labor and technology in executing our risk management plans.

Given this, we will now look at how we can apply CSF analysis to the risk management process.

Foundation for CSF Analysis

As a starting point, let us recap the definition of a Critical Success Factor, for in the definition we can see almost intuitively how CSF analysis relates directly to risk management. In his March-April 1979 seed paper, published in *Harvard Business Review*, in which he introduced Critical Success Factor theory, John Rockart defined Critical Success Factors as:

A) "The limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where things must go right for the business to flourish. If results in these areas are not adequate, the organization's efforts for the period will be less than desired."

B) "Areas of activity that should receive constant and careful attention from management."

Unless the CSF are stated in the form of an activity, applying the CSF to a given program presents many problems. Critical Success Factors are *activities*, not goals. They are therefore activities, *all* of which are critical to overall success. They are the things to which the program manager must give personal attention. Failure to accomplish the CSF successfully will be a major deterrent to overall program success. Activities can be tracked and measured. By doing so, we

can determine if the CSF are being accomplished successfully.

A fundamental premise of CSF theory is that if an activity is identified as critical to program success—and the program manager's time is focused on this activity, and program resources are expended to execute, evaluate, and measure this activity—the program is at reduced risk. Conversely, if an activity being given significant attention by a program manager is in fact not critical to program success—and precious program manager activity and attention is thereby being drawn away from items that actually are critical to success, and therefore do require program manager attention—the program is at increased risk.

Critical in CSF analysis is understanding the constraints upon which each CSF depends, for it is from understanding the constraints that both the CSF and the measures for each CSF are derived. It is also in understanding the constraints that much of the guesswork in risk assessment is alleviated. Additionally, changes in the constraints signal a manager when changes to the set of CSF are occurring. By applying the CSF analysis process, the manager learns how to think in terms of CSF; and once the process is learned it can be repeatedly applied to the current program when necessary, or can be applied for any subsequent assignment the manager undertakes.

The acquisition management strategy, which is inherently a risk management process, must be focused on the correct issues or the system will have a high probability of failure to achieve the program goals for cost, schedule, and performance. All three of these target goals, which are present for every program, are goals which are achieved, or not, depending on the success of the program manager in properly addressing the program risks.

The majority of the prior research done on CSF focused exclusively on CSF identification and did not investigate the three interrelated areas:

- CSF Identification
- Underlying Constraint Analysis
- Measure Identification.

Nor did any of the prior research attempt to apply CSF analysis to risk management. Acquisition risk management application of CSF analysis is essential for both individual programs and for systems of systems. It is also becoming increasingly important for acquisition management as we move to capability-based acquisition.

As programs advance toward completion, and given that each program has several intermediate milestones, CSF related to a given milestone can be determined. Each manager will be at a particular milestone point on his or her program, and the CSF identified may be milestone-dependent.

Successful managers do indeed identify CSF informally, as Gauss indicated. However, it is advantageous to have a *formal* process for doing so; likewise, it would be advantageous to DoD if each program manager understood and applied the process, as suggested by Air Force Lt. Gen. Robert Raggio. Without a clear set of CSF for the full program life cycle, including availability of a routine process for CSF re-examination, the program manager will continually face the risk of unknown factors with regard to program success, or may spend a considerable amount of his or her valuable time managing issues and evaluating data other than those critical to program success. This, in and of itself, is an additional risk to program success.

Explicit or Intuitive

Just as is sometimes done by their civilian counterparts, many of the more skillful program managers intuitively determine CSF to manage programs rather than rely on standard information from their own Management Information System (MIS). However, where the CSF are not explicitly identified and recorded, they do not become a part of the program history and are not explicit elements of the management reporting process. Furthermore, the underlying constraints for the CSF do not command

attention, and the CSF are seldom measured. A successor program manager, given his or her own skill level and background, may be more or less capable of intuitively identifying CSF or may focus on a different set of intuitively perceived CSF, if indeed any at all.

The result is that a given acquisition program may encounter wide swings in managerial focus and direction due to the particular skills and backgrounds of the different program managers who will attempt to guide the program to completion, each of them attempting to integrate and manage complex information related to several different functional disciplines. In the program management office, a different person may be responsible for each of these different disciplines.

In the absence of an active and continuous process of identification of the program CSF, this is all done without any documented continuity of those activities critical to program success, none of which have become part of the program history. However, through application of the CSF Process Model, once the CSF are explicitly identified and available to successor program managers, with the underlying constraints clearly and explicitly stated, the information gathered significantly supports program management stability and alleviates many of the adverse effects of program manager discontinuity. Once a set of CSF has been explicitly identified, communicated, and made part of the management reporting process, the likelihood that the set will be ignored becomes minuscule.

Therefore, establishing clear CSF to support the acquisition management of large defense programs would be a significant element of risk management and of eventual program success. This requires an iterative process for CSF identification and validation, analysis of the constraints underlying each CSF, and a determination of the measures needed for each identified CSF.

It is in the iterative analysis of the constraints behind each CSF that the likelihood of change in the CSF, or the need for new CSF, will be recognized.

Managerial Core Competencies

In a study on CSF in management environments done by Les Pickett and published in the Spring 1998 issue of *Public Personnel Management*, he addressed the need to focus on development of managerial core competencies. This study identified as two of the CSF for major organizations the importance of senior management responsibility: 1) to identify the enterprise core competencies, and 2) to ensure that managers and others in the workforce have competencies that are adequate and appropriate.

In this age of downsizing and rightsizing, it is interesting to note that in this major survey of global organizations, the author concluded that "Competent people are the key to future success and offer organizations their only sustainable competitive advantage." Among other Critical Success Factors identified in this report was the ability to create, apply, and extend knowledge in the workplace, which clearly fits into the DAU corporate university model.

This study also found that although learning as a business strategy is of major importance, the performance measures of many organizations today do not place value on knowledge as an asset. The report concludes that people must

be regarded and managed as an asset, not as an expendable resource.

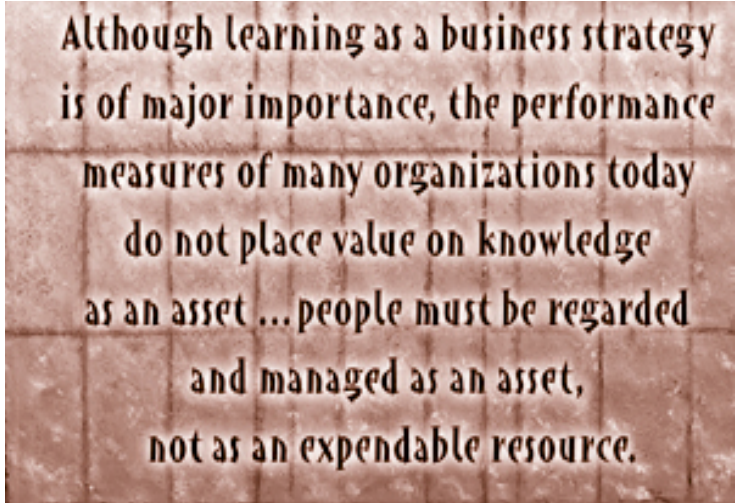
Another and similar report titled "Which Way to Competitive Advantage," was published in the January 1998 issue of *Strategic Management*. This article also focused attention on core competencies. It is an interesting inquiry into the current trends in strategic management and concludes that it is not *position in relation to competitors* that is key to success, but rather *where* the principal CSF are exploiting the resources, capabilities, and core competencies of the firm. The choice of strategy should be most influenced by how the organization can best exploit its core competencies relative to opportunities in the external environment, and not be dictated by the constraints of the environment. Program management certainly fits this picture.

Process Focus

The focus on process is important because in the program management environment today, so much is in constant flux, caused by rapid changes and advances in technology, changing technical or financial program requirements, corporate mergers, internationalization of many programs, use of Integrated Product Teams (IPT), moving to capabilities-based acquisition, and a focus on systems of systems. *Process* allows us to respond to a rapidly changing environment. *Tools* are generally not so flexible.

By using the CSF Process Model to identify contextually relevant CSF and their underlying constraints, together with

their corresponding data requirements, significant organizational implications become evident. Identification and documentation of the CSF at the top level of management will lead to the identification and documentation of CSF at the next lower level of management, with each set of CSF retaining its own corresponding data element identifications. More importantly, the



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identification of the CSF for the lower level managers, done in light of the CSF identified for the top level of management, results in a set of hierarchically consistent CSF covering multiple vertical levels of management, and can provide horizontal integration for systems of systems.

Each level of management will understand what the information needs are of the next higher level of management, and therefore what their own success criteria must be for overall organization success. Each level of management collectively will be able to provide the information and data necessary for management of the CSF at the next higher level, as well as assure that each has his or her own data necessary for management of each individual organization's CSF.

Application to Risk Management

A set of CSF is by nature very specific to a given manager, and must reflect that particular manager's needs at any given time. This leads to the conclusion that managers need a generalized process that can be used by any manager at any time to identify and evaluate the CSF pertinent to his or her job. Since the process is general, unlike the CSF which are highly specific, managers can apply the process, once learned, to any management environment in which they find themselves. It becomes a permanent part of their management thought process.

Thus, the successful identification and use of CSF at any point in the project life becomes primarily an issue of properly applying a general process, and recognizing the possibility of CSF changing over time. That CSF can change over time is not intuitively obvious. One naturally expects that CSF initially identified for a given program, with its given goals and purpose, will be relatively stable. In some programs this is true. While this possibility exists, conditions to which the program must respond frequently change, thereby causing a change to the program Critical Success Factors. These conditions can be technical-, financial-, or personnel-related.

In determining CSF, program managers are interviewed and asked to respond to a set of questions in the following 10 key categories defined as the basis for the model:

- Global or Industry Related
- External Influences
- Internal Influences
- Current and Future
- Temporal and Enduring
- Risk Abatement
- Performance
- Special Monitoring
- Quality
- Modification Management.

The interviewer uses a questionnaire-guided process to show that through CSF analysis, the manager is able to: 1) determine his or her contextually specific CSF, 2) identify the constraints underlying each identified CSF, and 3) determine the measures applicable to each identified CSF. Through application of the guided interview process, the constraints surface as managers discuss the issues of importance relative to each of the 10 criteria categories of the model.

The process is initiated by first identifying all elements of importance related to each of the 10 key criteria categories. These statements are then grouped by topic, regardless of the 10 categories in which they appeared. A CSF is then identified for each topic group, and these important items related to each topic are the underlying constraints for the CSF for that topic.

The CSF for each separate topic group are always stated as an activity. The candidate measures for the CSF are then derived from these same constraints. This enables managers to grasp the concept of connecting the underlying constraints to each CSF, and linking the measures for the CSF to these same underlying constraints. The underlying constraints involve little guesswork and can be cross-verified by others.

Because of the guidance provided through these areas of inquiry, a manager does not simply list the activities he or she believes are critical. This pre-

vents the manager from reacting to the most pressing current problem or the most recent crisis. The CSF are not explicitly stated by the manager. Rather, they are derived from the information provided by the manager as each of the 10 key areas are considered.

Therefore, the process itself works to prevent the use of identification of CSF as a form of crisis management, and leads the manager to view the program from a variety of perspectives, which are both tactical and strategic, and which focus on specific issues such as external support, performance, and quality. Therefore, the process itself, while giving the manager the freedom necessary to identify all issues critical to program success, also leads the manager to consider the program from several perspectives and provide a balanced view of the activities required for eventual success in reaching the goals of the program.

After the initial CSF identification process is completed, the complete set of constraints for all the CSF is examined for collective consistency. If a critical activity (constraint) required for CSF No. 1 is in conflict with a constraint forming part of the basis for CSF No. 2, then it may not be possible to do both CSF; and the manager must again examine the activities he or she has deemed critical to determine the root cause factors needed to resolve this conflict.

Two activities, both supporting CSF, cannot remain in conflict if the program is expected to be successful. If the underlying constraints supporting different CSF are in conflict, the CSF are necessarily in conflict. This conflict analysis is an important phase of the CSF Process Model and is used to determine the criticality and validity of the CSF. If the conflict cannot be resolved, this is an indicator the program success is at risk or the program goals need examination.

By determining and recording all three types of information—CSF identification, constraints, and measures—and

by making this part of the program office documentation, the managers will be able to incorporate the information needed to support the CSF into their executive Knowledge Management system, and use the information to determine when a change to a given CSF is occurring.

The key to understanding the need for the change is recognizing when documented constraints underlying a given CSF are no longer valid. The new or changed CSF, and its related constraint information, can then be used as the foundation for revising the Knowledge Management information, the strategic plan, and possibly the organizational structure, in any way necessary for the manager to have the best possible information and implementation strategy for managing the program and accomplishing the CSF.

Once managers have gone through this process with the interviewer, they should understand the process well enough to perform the CSF analysis on their own without any outside assistance. Since this is a process and not a list, the manager can apply the process again at a later time to the same program, or can apply the same process to another program to which he or she is assigned.

When the resultant information is used in the actual management setting, and since the linking information between the CSF and the CSF measures is the set of constraint data, the stability of the constraint data will serve as the key to understanding if and when a given CSF should be re-evaluated. When it is said that a CSF may be changing, the possibility is that it may change slightly or that it may go away altogether. The degree of change is determined by the extent and effect of the changes occurring in the underlying constraint information. When a CSF changes, an extended analysis should

also be done of the changes in all of the constraint information to determine if new CSF are surfacing.

Quantitative Analysis

One desire of many managers is to have some kind of quantitative analysis. The CSF Process Model provides that as a part of the overall analysis. When the report is complete, the same information gathered in the interview and used to derive the CSF and the measures is used as input information for a spreadsheet quantitative risk analysis. Questions asked during the interview, or data derived from the interview, are used to answer 20 questions for this quantitative analysis. Typical questions, among others, follow:

- Whether the program goals have been explicitly stated
- Whether a critical path analysis has been done.
- Whether the CSF are consistent with each other.
- Whether there is at least one CSF for each life cycle phase.
- Whether constraints are clearly identified for each CSF
- Whether measures have been identified.
- Whether the data needed for measurement of the CSF are available.

Each question has a weighting factor. A numerical score is derived for each CSF, and the final score for each CSF is then evaluated as LOW, MEDIUM, or HIGH risk, with respect to the risk of being

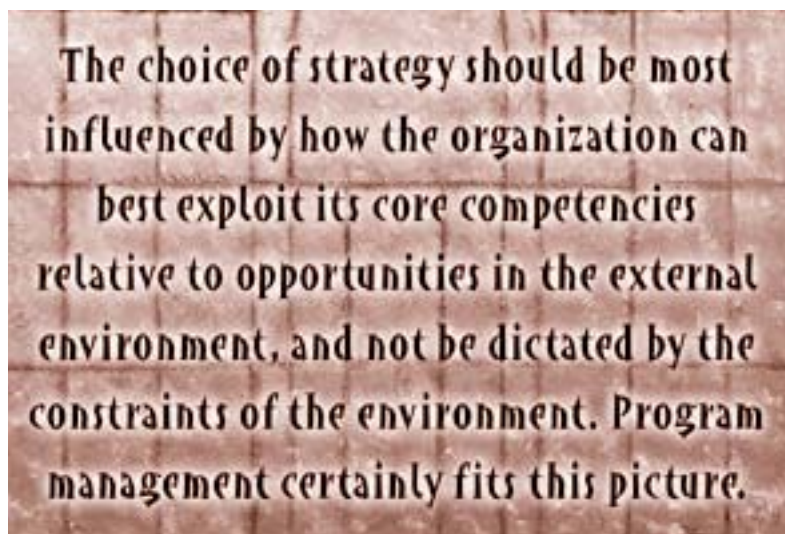
able to successfully accomplish that CSF. The LOW, MEDIUM, or HIGH rating is assessed based on a range within which the numerical score falls. By having the numerical score as well as the LOW, MEDIUM, or HIGH rating, the manager can see how close or how far each score is to the next higher rating. Then an overall program numerical score is derived, and an overall program LOW, MEDIUM, or HIGH rating is assessed.

A significant advantage of this spreadsheet-based analysis is that each individual CSF is evaluated. Therefore, if a given CSF has a score less than desired, the manager knows where to concentrate his or her attention to achieve success. From the spreadsheet information, the manager understands specifically why the score is less than desired, and therefore what must be done to correct this situation.

Walking a Tightrope

We can make several observations after having analyzed the application of the CSF Process Model to several programs. The first observation has to do with scope and complexity. Some programs dealt with a level of complexity that could almost be considered routine. Others dealt with issues that are very significant but which are limited in their breadth. Alternatively, the issues with which other cases had to deal are extremely diverse. The application of state-of-the-art technology, personnel issues, political issues, contracting issues, and budgetary issues were all converging on these managers. The program budgets are very large, the issues are complex, and yet the same CSF Process Model was employed, in the same way, by all of these managers. The stability of the process transcended all of the scope and diversity issues found on all of the programs investigated to date.

If we examine an industrial environment and



consider the types of issues that must be dealt with, and the levels of responsibilities, there seems to be very little essential difference between the issues the managers must respond to in private industry and those dealt with by the managers for whom the CSF Process Model has been used. All of these managers deal with contracting issues, suppliers, procurement, technology application or technology development, or both; and they all deal with budgetary and personnel issues.

Whether a manager is a Chief Executive Officer (CEO), a Chief Technology Officer (CTO), or Chief Financial Officer (CFO); whether he or she is a DoD Program Manager, a PEO, a dean of a university, or a bishop managing a large diocese—all of them will be dealing with issues that can be evaluated using the CSF Process Model.

As long as the managers are intelligent and competent, there is every reason to expect that application of the CSF Process Model will produce results for any manager or group of managers that would be as successful as those produced by the managers interviewed so far. The specific objective of the project being managed, or the organizational environment within which the manager functions, may be different from the situations of the managers interviewed thus far; but those are contextual issues and, as the research done to date shows, contextual issues do not interfere with the effectiveness of the application of the CSF Process Model.

In some cases, the detailed identification of the constraints for one or more CSF may not be clear cut and may require significant effort to resolve. In some cases, the issue is identifiable, but the activities required to successfully address the issue are not so obvious. It may be a need to develop a plan to respond to some near-term emergency such as a funding or manpower shortfall. In others, it may be a need to decide how critical technical resources will be allocated over the life of the program. The impact of these decisions may involve millions of dollars.

In these cases, the CSF Process Model may have to be repeated periodically as the information needed to address the issues adequately becomes more definitive. Some of the managers interviewed to date have had these kinds of issues to address—some short-term and some strategic. In industry at large, similar difficulties also arise when trying to decide how to respond to a new competitive threat or how best to restructure a company or division.

In general, issues that require skill in strategic thinking are very troublesome for managers whose strategic thinking ability is limited. It is also not always obvious in advance that skill in strategic thinking is needed, or that the skill is absent, since this skill or lack thereof is often independent of intelligence. Some very bright people simply do not have strategic thinking skills. Sometimes the lack of ability to think strategically begins to surface when probing questions are asked and the response clearly shows a lack of recognition of the strategic aspect of the question.

In such a case, the manager will often revert back to what he or she is comfortable with and address something peripheral to the question raised, but which is more immediate in terms of a response to the question. This places a burden on the interviewer not to do the thinking for the manager, but to perhaps ask some leading questions to see how well the implications of what has been said are understood. In such an instance, the interviewer is walking a tightrope to avoid injecting interviewer bias into the results. The results have to be the manager's, not the interviewer's. It remains to be shown by further research whether this issue of the ability to do strategic thinking may be a limiting factor in determining the lowest level of management to which the CSF Process Model can be effectively applied.

The larger and more complex a program is, the more complex are the integration decisions related to the various critical elements. By effectively applying the CSF Process Model, and iterating on this process at periodic intervals, the pro-

gram manager is able to focus on those activities of critical importance to project success and incorporate the results into the various elements of the strategic management process. This is particularly important as we move toward management of systems of systems and toward capability-based acquisition.

Should every program manager be encouraged to perform a CSF analysis? From the information gathered thus far, the primary candidates are those managers of programs with relatively high technical, business, or organizational complexities, which may jeopardize achievement of program goals and objectives if not managed with considerable care and attention. Many of these programs have a high budget, but that is not an absolute criteria.

Managers whose programs are relatively routine and which can be managed well using typical everyday management techniques, may be successful if they use their normal risk analysis process and then do a CSF analysis only if something unusual or threatening surfaces. Executive managers, such as the PEO, should perhaps prioritize the programs on which a CSF analysis is recommended and assure that the managers for those programs are able to conduct the analysis effectively. In some cases, it would be advantageous for both the government program manager *and* the prime contractor program manager to each complete a CSF analysis.

Should all program managers learn how to perform a CSF analysis? Since conducting an effective CSF analysis requires more than making a list, and primarily requires learning how to think in a different way, education in the CSF analysis process and learning how to think in terms of CSF might be of benefit to all managers. It may broaden their analytical skills and, should the need suddenly arise, it will put them in a position to be able to quickly perform a CSF analysis.

Editor's Note: Dobbins welcomes questions or comments on this article. Contact him at jim.dobbins@dau.mil.